rural development
& land reform

Department:
Rural Development and Land Reform
REPUBLIC OF SOUTH AFRICA

aurecon

PROJECT MANAGEMENT FOR THE ESTABLISHMENT OF A BULK INFRASTRUCTURE PROJECT IN NKANDLA

CLIENT PROJECT NO: CRDP T12-0032(2011/2012)

AURECON PROJECT NO: 108436

ENGINNERING SERVICES SUPPLEMENTARY REPORT

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1. Engineering Services: Additional Information

1.1 Sewer

The sewer network layout is largely dictated by the positions of buildings and roads. Two sewer network possibilities have been investigated for the supply of the proposed development. The preferred alternative as indicated in drawing 1133/300/01, included in the appendices comprises approximately 3200 m of 160 mm diameter uPVC pipe. As a result of the prevailing topography a portion of the outfall system will be fed to a pump station where effluent will be pumped to a point where it can again gravitate to the treatment plant. Effluent shall be treated in a package plant.

The preferred option has been chosen for lowest energy demand to pump sewage by a lower elevation difference and also to avoid a clash between the final effluent pond and the storm water attenuation pond.

Design criteria for the proposed sewer system have been taken from the Guidelines for Human Settlements Planning and Design, 'Redbook'. The total estimated demand once peak factors have been applied is approximately 54 l/s. Minimum pipe gradients will be 1:80 or 1.25%. It will be attempted to generally keep to maximum gradients of 1:20 or 5%.

The minimum pipes sizes for reticulation networks (160 mm), whose capacity is more than the expected flow, have been chosen in line with Red Book recommendations.

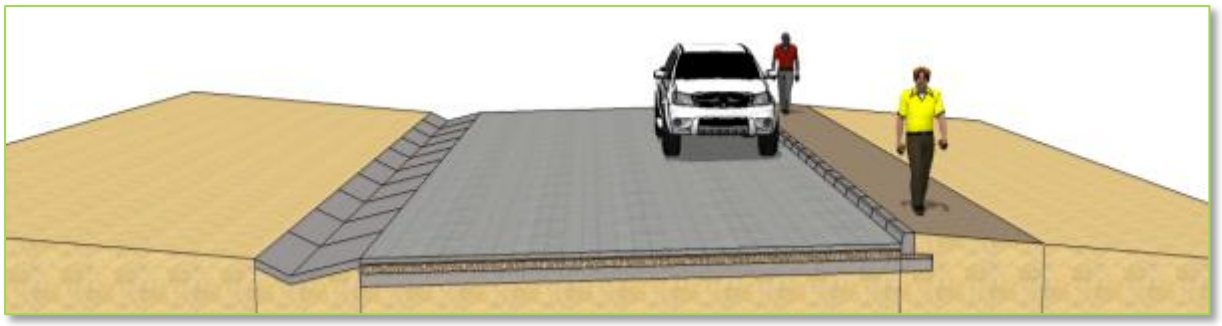
1.2 Water

The estimated average daily demand of the proposed development will be 1.6 Ml/day once fully developed. An existing local pump station near Mkhalazi will supply water. It is proposed that storage facilities with a capacity of 3.2 Ml be established as part of the development. The storage will be provided by a reinforced concrete circular reservoir with a diameter of 30 metres and a height of approximately 4.5 metres. It will have a concrete roof. Level control will be provided by a Bermad Altitude Valve or similar. At the time of design the storage facility will be sized and placed in conjunction with the WSA to fit with their reticulation needs in the general area. Bulk supply shall be provided through a 300 mm diameter uPVC line. Minimum pipe diameters will be 75mm in the reticulation to allow for both domestic use and fire demand. Pipelines will generally follow alongside roads.

1.3 Roads

Access to the proposed development shall be via provincial road P15-2. Access roads shall be Class 5a access collectors with a 6 m gravel surfaced width, while short access courts and cul-de-sac shall have a reduced width of 5 m. The minimum road reserve width shall be 26 m. Road geometry shall be in accordance with accepted design standard such as the 'Guideline for Human Settlement Planning and Design (Redbook), or similar approved standard. Drawing/Figure 108436-Roads, included in the appendices shows the proposed road network.

Appropriate surface drainage in the form of open drains feeding into a pipe network shall be applied to intercept surface runoff and discharge this water in a controlled manner so as to reduce erosion. Figure below indicates a typical section showing crossfall with an open side drain.



The pavement design for the proposed roads shall be determined from the anticipated fairly low traffic volumes. Generally they will comprise 450 mm layer work, with a 150 mm wearing course of approved gravel. Wherever possible road materials should be of local origin, ideally from the same location. Where the local material is not suitable for the road then imported material should be chosen for its cost and strength. Roads are upgradeable to bituminous surface once vehicle volumes justify. The table below provides a brief summary of the proposed road network, broken down to indicate road widths.

Table 1

ROAD	RESERVE SIZE (m)	LENGTH (m)	WIDTH (m)	MATERIAL DESCRIPTION
ROAD 1	26.0	590.0	6.0	Gravel
ROAD 2	26.0	484.0	6.0	Gravel
ROAD 3	26.0	309.0	6.0	Gravel
ROAD 4	26.0	341.0	6.0	Gravel
ROAD 5	26.0	292.0	6.0	Gravel
ROAD 6	26.0	485.0	6.0	Gravel
ROAD 7	26.0	75.0	6.0	Gravel
ROAD 8	26.0	355.0	6.0	Gravel
ROAD 9	26.0	381.0	6.0	Gravel
ROAD 10	26.0	340.0	6.0	Gravel
ROAD 11	26.0	65.0	6.0	Gravel
ROAD 12	26.0	409.0	6.0	Gravel
ROAD 13	26.0	255.0	6.0	Gravel
ROAD 14	26.0	438.0	6.0	Gravel
ROAD 15	26.0	305.0	6.0	Gravel
ROAD 16	26.0	63.0	6.0	Gravel
ROAD 17	26.0	62.0	6.0	Gravel
ROAD 18	26.0	27.0	6.0	Gravel
Subtotal : 6.0 m wide roads		**5276.0**		

Table 2

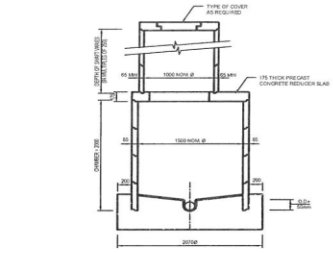
ROAD	RESERVE SIZE (m)	LENGTH (m)	WIDTH (m)	MATERIAL DESCRIPTION
ROAD 19	26.0	104.0	5.0	Gravel
ROAD 20	26.0	96.0	5.0	Gravel
ROAD 21	26.0	89.0	5.0	Gravel
ROAD 22	26.0	38.0	5.0	Gravel
ROAD 23	26.0	35.0	5.0	Gravel
ROAD 24	26.0	35.0	5.0	Gravel
ROAD 25	26.0	35.0	5.0	Gravel
Subtotal : 5.0 m wide roads		**432.0**		
Total : roads		**5708.0**		

1.4 Stormwater

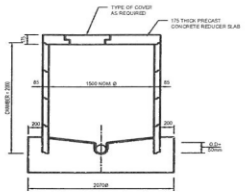
Prior to commencement of construction a detailed stormwater management plan shall be undertaken to accurately assess catchments and the associated runoff to confirm sizing of the various elements of the network determined during preliminary stages. Major systems shall be sized to accommodate flows generated by the 1:50 year event while minor systems shall accommodate the 1:10 year event.

The proposed stormwater network identified during preliminary assessment as indicated in KBN185-01-01, comprises of a pipe network of approximately 4 400 m. A minimum pipe diameter of 450 mm has been determined. Pipes shall be concrete spigot and socket. All piped systems shall be designed for self-cleaning flow velocities. Storm water runoff shall be intercepted and attenuated where possible. Attenuation ponds will allow for controlled release of runoff and further act as a sediment trap. Attenuation ponds can further be used for rainwater harvesting, if desired. An attenuation pond is indicated in the drawing, with a capacity of 9 000 cubic metres.

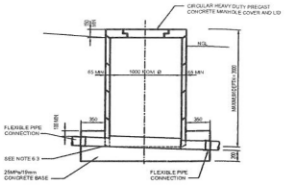
ANNEXTURE 1: SEWERS



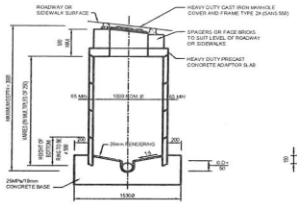
SECTION THROUGH MANHOLE
WHERE DEPTH EXCEEDS 3,0m
1:25



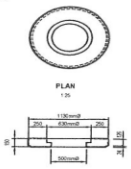
SECTION THROUGH MANHOLE WHERE DEPTH
EXCEEDS 3,0m OR PIPE DIAMETER EXCEEDS 160mm
1:25



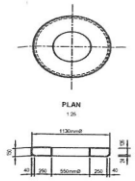
SECTION THROUGH MANHOLE WITH HEAVY
DUTY PRECAST CONCRETE MANHOLE COVER AND LID
1:25



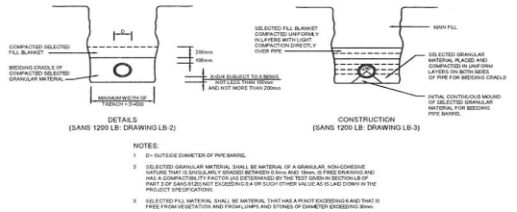
SECTION THROUGH MANHOLE WITH TYPE 2A
HEAVY DUTY CAST IRON MANHOLE COVER AND FRAME
1:25



SECTION
1:25
CIRCULAR HEAVY DUTY
MANHOLE COVER SLAB



SECTION
1:25
CIRCULAR ADAPTOR SLAB

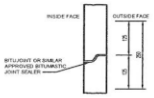


DETAILS
(SANS 1200 LB: DRAWING LB-2)

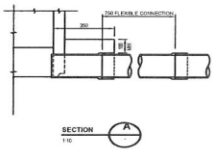
CONSTRUCTION
(SANS 1200 LB: DRAWING LB-3)

NOTES:
1. D= OUTSIDE DIAMETER OF PIPE BARREL
2. SELECTED GRANULAR MATERIAL SHALL BE MATERIAL OF A GRANULAR, NON-COHESIVE NATURE THAT IS SINGULARLY GRADED BETWEEN 9.5mm AND 19mm, IS FREE DRAWING AND HAS A COMPACTIBILITY FACTOR (AS DETERMINED BY THE TEST GIVEN IN SECTION LB-07 PART 3 OF SANS 612:00 NOT EXCEEDING 6.4 OR SUCH OTHER VALUE AS IS LAID DOWN IN THE PROJECT SPECIFICATION)
3. SELECTED FILL MATERIAL SHALL BE MATERIAL THAT HAS A PI NOT EXCEEDING 6 AND THAT IS FREE FROM VEGETATION AND FROM LUMPS AND STONES OF DIAMETER EXCEEDING 30mm.

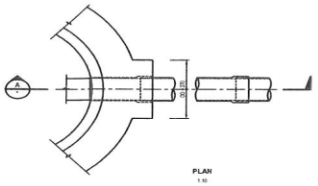
FLEXIBLE PIPE BEDDING
N.T.S



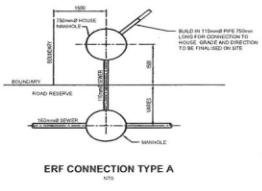
DETAIL OF WATERTIGHT
MANHOLE WALL JOINT
1:5



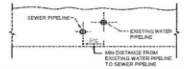
DETAIL OF FLEXIBLE PIPE JOINT



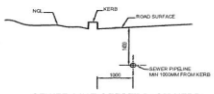
PLAN
1:10



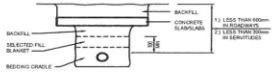
ERF CONNECTION TYPE A
N.T.S



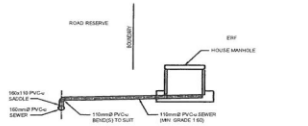
DISTANCE BETWEEN EXISTING SERVICES
1:50



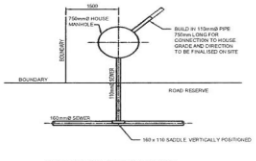
SEWER LINE OFFSET FROM KERB
1:50



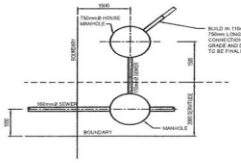
PROTECTION OF PIPES AT
REDUCED DEPTHS OF COVER
N.T.S



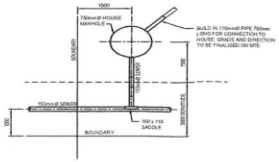
TYPICAL SECTION THROUGH DIRECT ERF CONNECTION
1:50



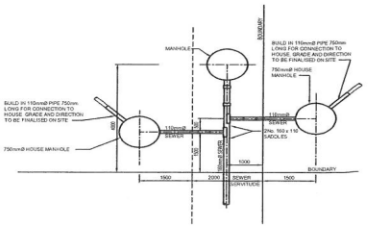
ERF CONNECTION TYPE B
N.T.S



ERF CONNECTION TYPE C
(MIDBLOCK)
N.T.S



ERF CONNECTION TYPE D
(MIDBLOCK)
N.T.S



ERF CONNECTION TYPE E
(MIDBLOCK)
1:50

TYPICAL SECTION THROUGH
SLOPING DROP ERF CONNECTION
1:50

Drawing Title : NSGC: Proposed Sewer Layout (non-feasible)
Drawing Number : 108436 - Sewer
Sheet Number : 1 of 1
Scale : 1 : 4 000
Rev: A (alternative 2)
N
Legend
Proposed_Sewer_Manholes
Proposed Pump Station / WWTW
Proposed Rising Main
Proposed Sewer Lines
Contours
SIGNATURE:
DATE:
(The master copy held at Aurecon (eThekwini office) bears the original signature of approval)
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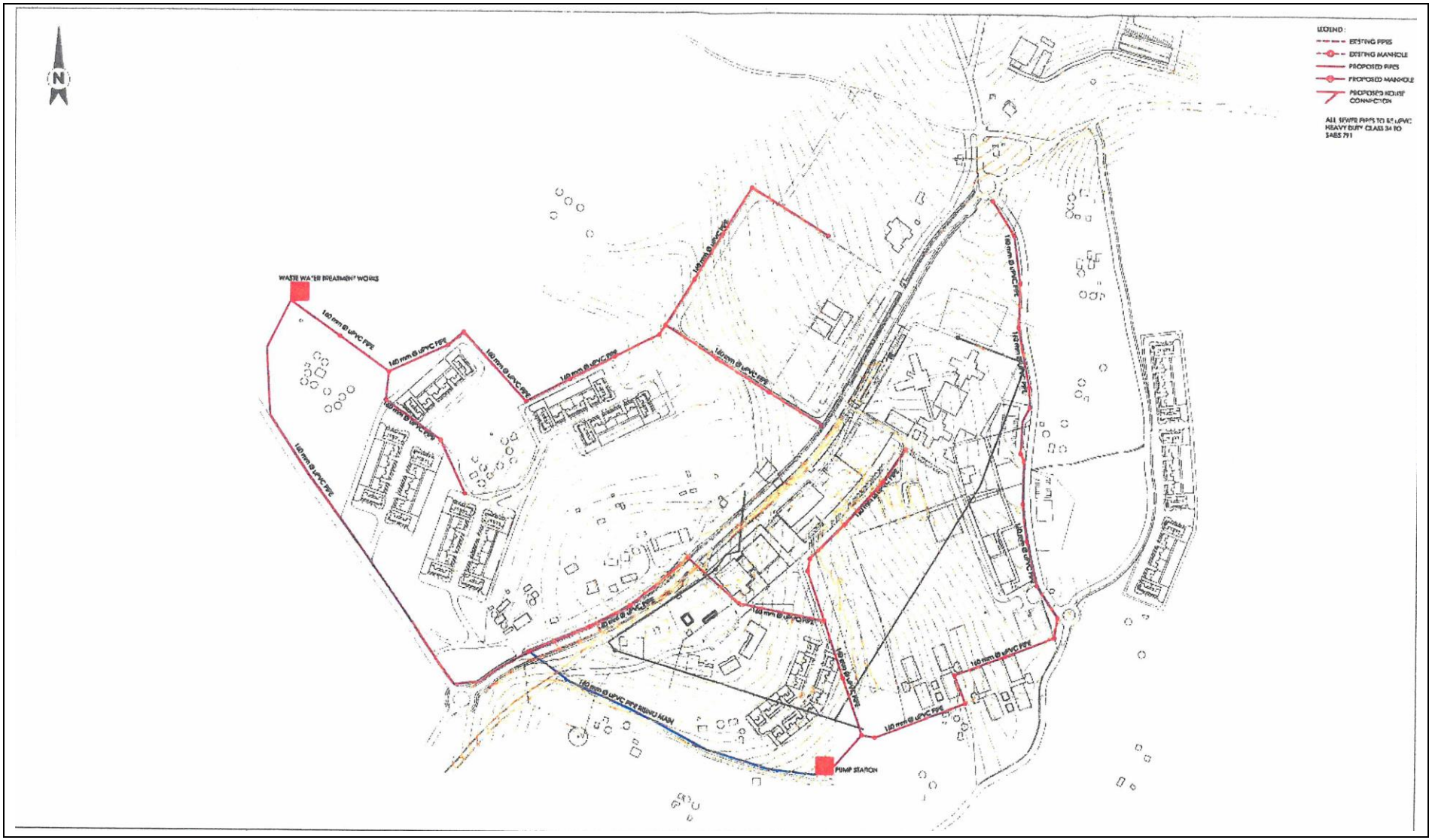
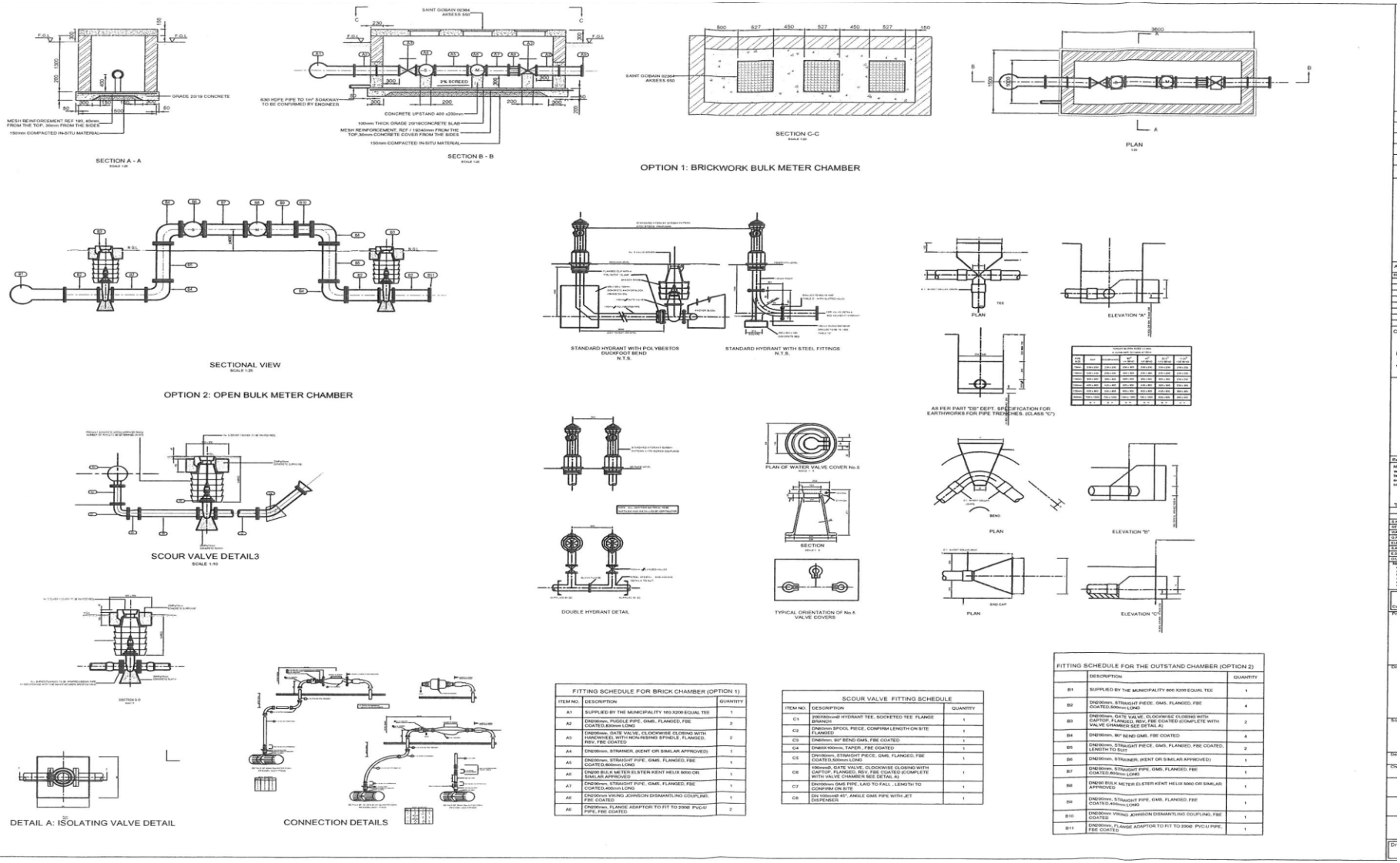
aurecon
eThekwini
Pump Station
Waste Water Treatment Works
160 mm ø uPVC Pipe
160 mm ø uPVC Rising Main


N
LEGEND :
EXISTING PIPES
EXISTING MANHOLE
PROPOSED PIPES
PROPOSED MANHOLE
PROPOSED HOUSE CONNECTION
ALL SEWER PIPES TO BE UPVC HEAVY DUTY CLASS 34 TO SABS 791
WASTE WATER TREATMENT WORKS
160 mm Ø UPVC PIPE
160 mm Ø UPVC PIPE RISING MAIN
PUMP STATION

ANNEXTURE 2: WATER



FITTING SCHEDULE FOR BRICK CHAMBER (OPTION 1)

ITEM NO.	DESCRIPTION	QUANTITY
A1	SUPPLIED BY THE MUNICIPALITY 160 X200 EQUAL TEE	1
A2	DN100mm, PUDDLE PIPE, GMS, FLANGED, FBE COATED,630mm LONG	2
A3	DN200mm, GATE VALVE, CLOCKWISE CLOSING WITH HANDWHEEL WITH NON-RISING STINDLE, FLANGED, RSV, FBE COATED	2
A4	DN200mm, STRAINER, (KENT OR SIMILAR APPROVED)	1
A5	DN200mm, STRAIGHT PIPE, GMS, FLANGED, FBE COATED,800mm LONG	1
A6	DN200 BULK METER ELSTER KENT HELIX 8000 OR SIMILAR APPROVED	1
A7	DN200mm, STRAIGHT PIPE, GMS, FLANGED, FBE COATED,400mm LONG	1
A8	DN200mm VIKING JOHNSON DISMANTLING COUPLING, FBE COATED	1
A9	DN200mm, FLANGE ADAPTOR TO FIT TO 200Ø PVC-U PIPE, FBE COATED	2

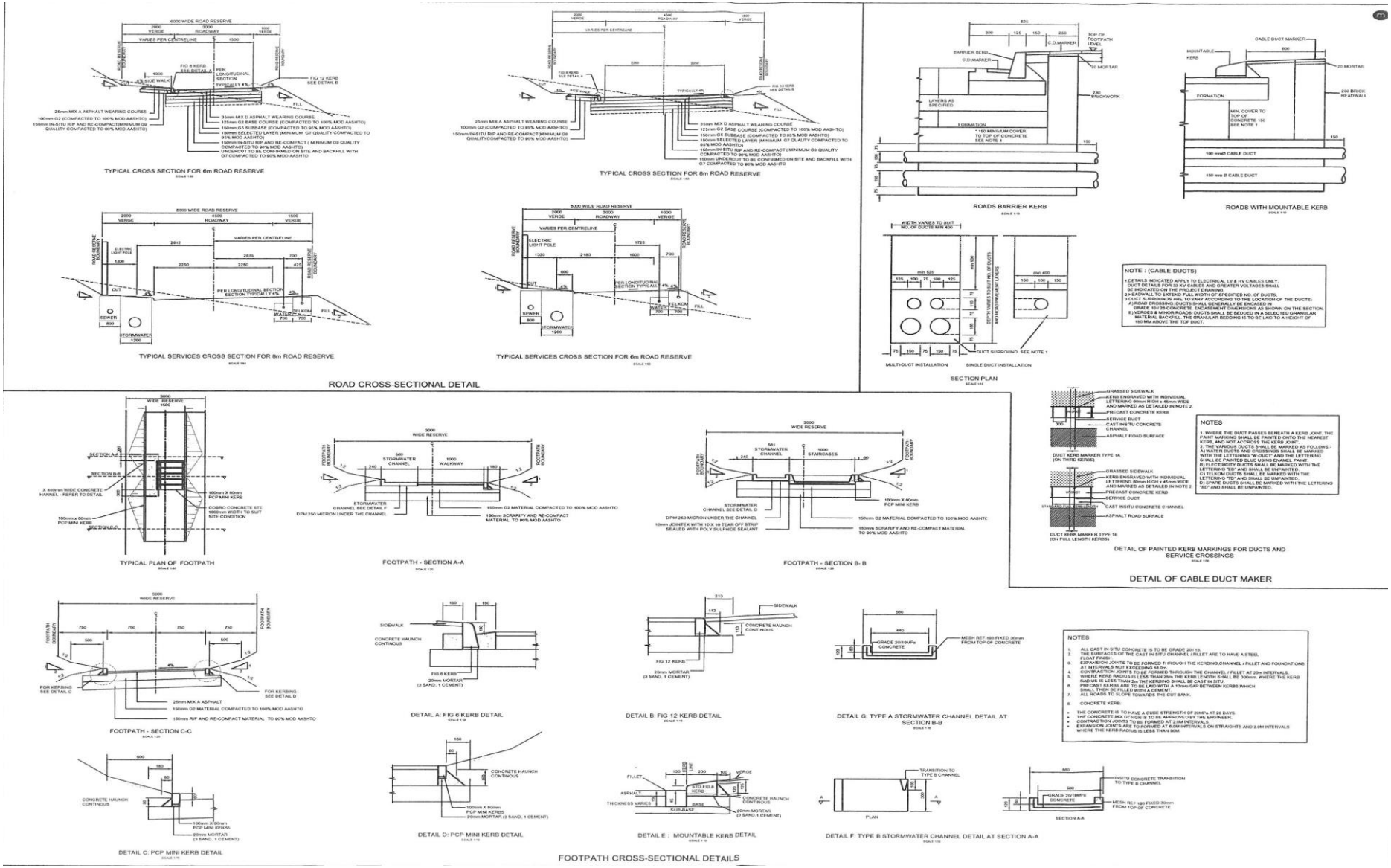
SCOUR VALVE FITTING SCHEDULE

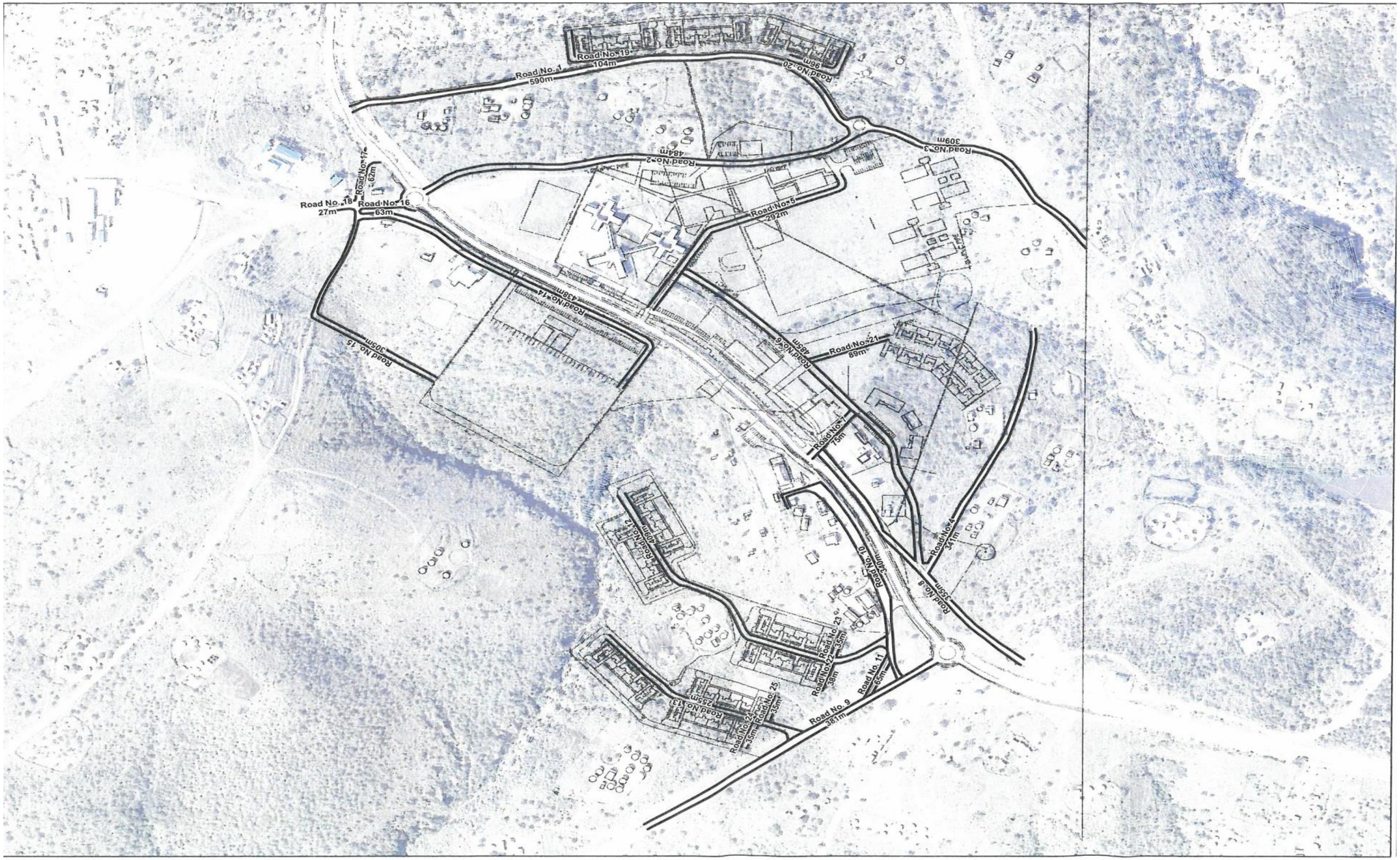
ITEM NO.	DESCRIPTION	QUANTITY
C1	315X150mmØ HYDRANT TEE, SOCKETED TEE FLANGE BRANCH	1
C2	DN630mm SPOOL PIECE, CONFIRM LENGTH ON SITE FLANGED	1
C3	DN80mm, 90° BEND GMS, FBE COATED	1
C4	DN600X100mm, TAPER, FBE COATED	1
C5	DN100mm, STRAIGHT PIECE, GMS, FLANGED, FBE COATED,500mm LONG	1
C6	100mmØ, GATE VALVE, CLOCKWISE CLOSING WITH CAPTOP, FLANGED, RSV, FBE COATED (COMPLETE WITH VALVE CHAMBER SEE DETAIL A)	1
C7	DN100mm GMS PIPE, LAID TO FALL , LENGTH TO CONFIRM ON SITE	1
C8	DN 100mmØ 45°, ANGLE GMS PIPE WITH JET DISPENSER	1

FITTING SCHEDULE FOR THE OUTSTAND CHAMBER (OPTION 2)

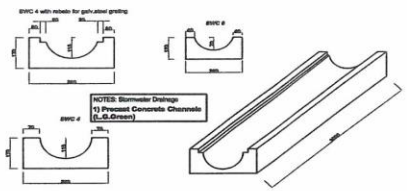
	DESCRIPTION	QUANTITY
B1	SUPPLIED BY THE MUNICIPALITY 600 X200 EQUAL TEE	1
B2	DN200mm, STRAIGHT PIECE, GMS, FLANGED, FBE COATED,500mm LONG	4
B3	DN200mm, GATE VALVE, CLOCKWISE CLOSING WITH CAPTOP, FLANGED, RSV, FBE COATED (COMPLETE WITH VALVE CHAMBER SEE DETAIL A)	2
B4	DN200mm, 90° BEND GMS, FBE COATED	4
B5	DN200mm, STRAIGHT PIECE, GMS, FLANGED, FBE COATED, LENGTH TO SUIT	2
B6	DN200mm, STRAINER, (KENT OR SIMILAR APPROVED)	1
B7	DN200mm, STRAIGHT PIPE, GMS, FLANGED, FBE COATED,800mm LONG	1
B8	DN200 BULK METER ELSTER KENT HELIX 5000 OR SIMILAR APPROVED	1
B9	DN200mm, STRAIGHT PIPE, GMS, FLANGED, FBE COATED,400mm LONG	1
B10	DN200mm VIKING JOHNSON DISMANTLING COUPLING, FBE COATED	1
B11	DN200mm, FLANGE ADAPTOR TO FIT TO 200Ø PVC-U PIPE, FBE COATED	1

ANNEXTURE 3: ROADS


TYPICAL CROSS SECTION FOR 6m ROAD RESERVE
TYPICAL CROSS SECTION FOR 8m ROAD RESERVE
TYPICAL SERVICES CROSS SECTION FOR 8m ROAD RESERVE
TYPICAL SERVICES CROSS SECTION FOR 6m ROAD RESERVE
ROAD CROSS-SECTIONAL DETAIL
ROADS BARRIER KERB
ROADS WITH MOUNTABLE KERB
SECTION PLAN
NOTE : (CABLE DUCTS)
TYPICAL PLAN OF FOOTPATH
FOOTPATH - SECTION A-A
FOOTPATH - SECTION B- B
DETAIL OF PAINTED KERB MARKINGS FOR DUCTS AND SERVICE CROSSINGS
DETAIL OF CABLE DUCT MAKER
FOOTPATH - SECTION C-C
DETAIL A: FIG 6 KERB DETAIL
DETAIL B: FIG 12 KERB DETAIL
DETAIL G: TYPE A STORMWATER CHANNEL DETAIL AT SECTION B-B
DETAIL C: PCP MINI KERB DETAIL
DETAIL D: PCP MINI KERB DETAIL
DETAIL E : MOUNTABLE KERB DETAIL
DETAIL F: TYPE B STORMWATER CHANNEL DETAIL AT SECTION A-A
FOOTPATH CROSS-SECTIONAL DETAILS

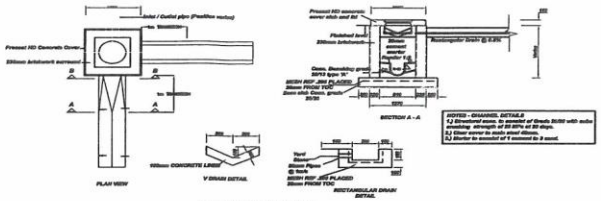

Road No. 19
104m
Road No. 1
590m
Road No. 20
96m
Road No. 3
309m
Road No. 2
484m
Road No. 17
62m
Road No. 18
27m
Road No. 16
63m
Road No. 5
292m
Road No. 14
438m
Road No. 15
305m
Road No. 6
485m
Road No. 21
89m
Road No. 7
75m
Road No. 4
341m
Road No. 10
330m
Road No. 8
355m
Road No. 12
Road No. 23
35m
Road No. 22
38m
Road No. 11
65m
Road No. 9
381m
Road No. 13
255m
Road No. 24
35m
Road No. 25
35m

ANNEXTURE 4: STORMWATER



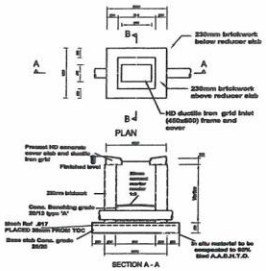
STORMWATER CHANNEL DETAILS DETAILS

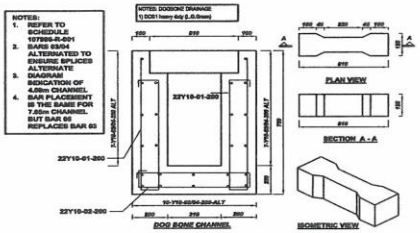
NTS



CHANNEL DETAILS

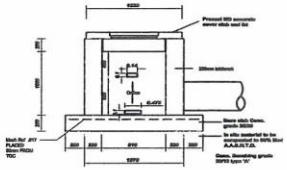
NTS





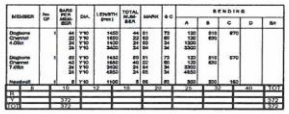
CHANNEL WITH DOG BONE DRAINAGE DUCT COVER

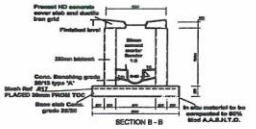
SCALE 1:10



ATTENUATION STRUCTURE DETAIL

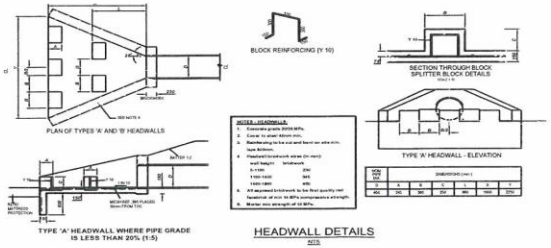
SCALE 1:20





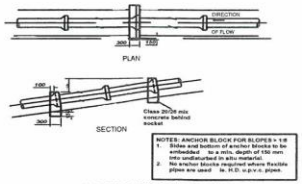
GRID INLET DROP MANHOLE

NTS



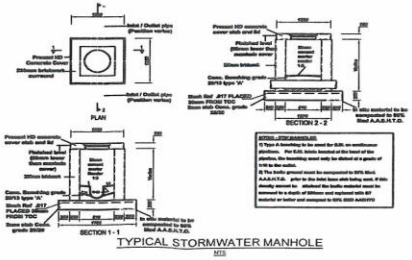
HEADWALL DETAILS

NTS



ANCHOR BLOCK DETAILS

SCALE 1:20



TYPICAL STORMWATER MANHOLE

NTS

Legend:	
	PROPOSED STORMWATER RETICULATION

No.	DATE	By	Details
A	05/10/11	AN	ISSUED FOR PROPOSED DESIGN

REVISION

PROJECT
uMLALAZI NKANDLA SMART GROWTH DEVELOPMENT CENTRE

DRAWING TITLE
PROPOSED STORMWATER RETICULATION

DRAWN BY	AJ4	PROJECT NO.	KBN185
CHECKED BY	D.N	DWG NO.	KBN185-01-01
DATE	August 2011	FILE NO.	-
SCALE	1 : 1250	REV.	A
SHEET SIZE	A0		

CLIENT
Department of rural development & land reform

rural development & land reform
Department:
Rural Development and Land Reform
REPUBLIC OF SOUTH AFRICA

INSTITUTION
-

SERVICE
PROPOSED STORMWATER RETICULATION

CONTRACT
uMLALAZI NKANDLA SMART GROWTH DEVELOPMENT CENTRE

DISCIPLINE
CIVIL ENGINEERING SERVICES

WORK DESCRIPTION
PROPOSED DESIGN

DRAWING DESCRIPTION
-

FILE NO.		ITEM NO.	
DESIGN	-	DRAWN	-
SCALE	1 : 1250	CHECKED	-

RESPONSIBLE PROFESSIONAL

DATE	NAME	SIGNED	PR. NUMBER
AUGUST 2011	-		-

DRAWING CO-ORDINATED

CONSULTANT
KOMBANI CONSULTING

CONTRACTOR

CAD SYSTEM	Autocad	FILE NAME	

SHEET SIZE	DRAWING NUMBER	REV.
A0	KBN185-01-01	A

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eThekwini

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SIGNATURE:

DATE:

(The master copy held at Aurecon (eThekwini office) bears the original signature of approval)

Legend

- Proposed Stormwater Manholes
- Proposed Stormwater Pipes
- Contours

N

Drawing Title : NSGC: Proposed Stormwater Layout (non-feasible)

Drawing Number : 108436 - Stormwater

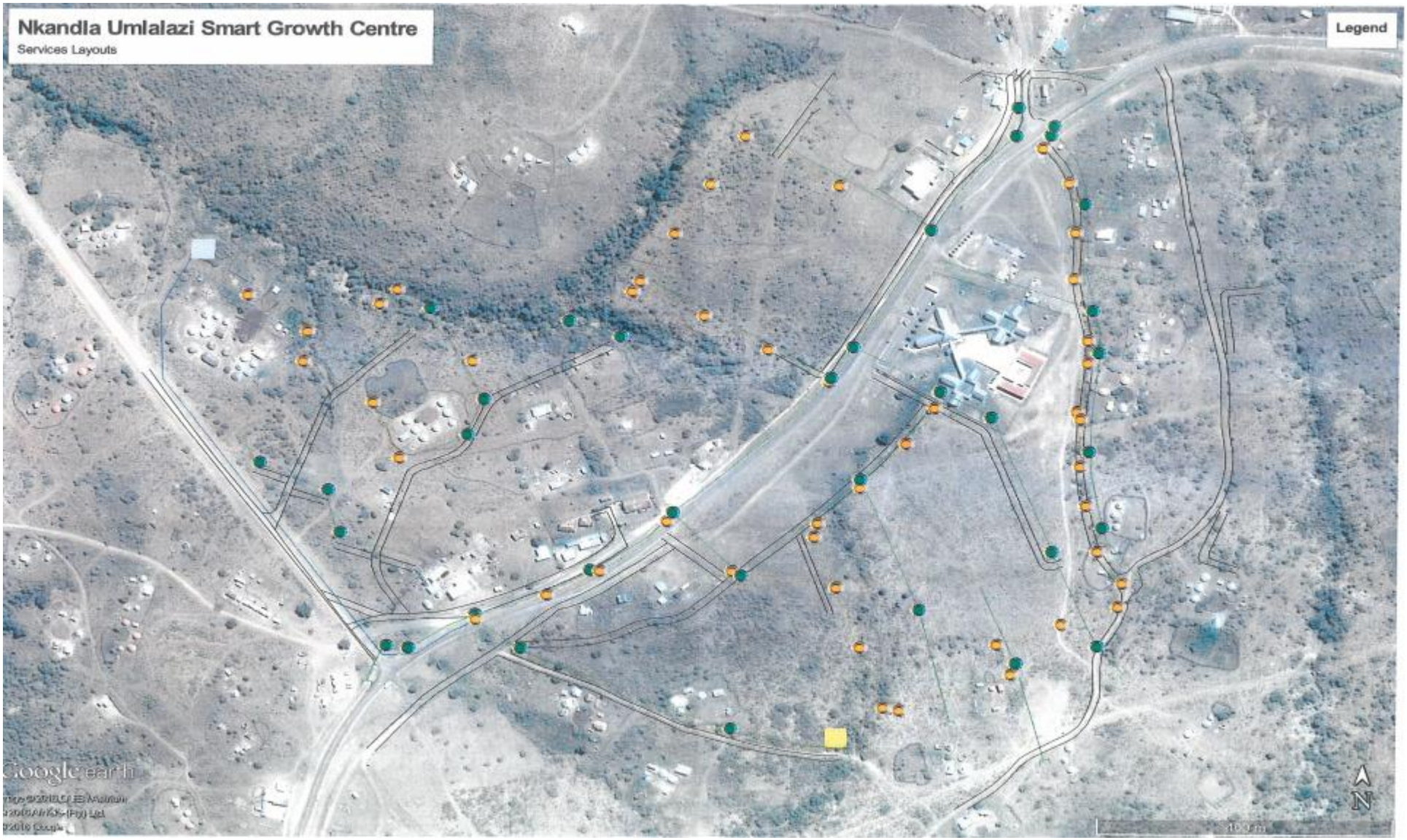
Sheet Number : 1 of 1

Scale : 1 : 4 000

Rev: A (alternative 2)

Date : March 2015

ANNEXTURE 5: KMZ LAYOUT


Nkandla Umlalazi Smart Growth Centre
Services Layouts
Legend
N